

**SERVICE MARKET ANALYSIS AND FORECAST
TELECOMMUNICATIONS**

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ABSTRACT

Telecommunications service is one of the most dynamic markets in the industry. Hardware shipment increases fueled by user demands for greater connectivity and extremely high user expectations for availability have combined to make this the fastest growing service sector. But critical issues remain to be solved if service vendors are to realize the revenue and profit potentials.

This report analyzes the market for maintenance and service on telecommunications equipment in the U.S. from 1985-1990. The report focuses on identifying trends in service and making recommendations to help vendors adapt to changing conditions. Some of the major topics discussed in this report include:

- Forecast of telecommunications service market.
- The growing impact of manufacturers.
- The importance of non-hardware service.
- Dealing with high user expectations.

This report contains 86 pages, including 22 exhibits.

SERVICE MARKET ANALYSIS AND FORECAST TELECOMMUNICATIONS

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I INTRODUCTION

I INTRODUCTION

- The telecommunications service market is growing rapidly as a result of the demand for quality connectivity and the increased opportunities in service created by the deregulation of the industry. But, like vendors in the early computer service markets, telecommunications service vendors have yet to establish service delivery strategies that will ensure service profitability as the market matures. The industry leader, AT&T, has been cutting its massive, labor-intensive service force in search of a profitable business, and new entrants are expanding their service delivery networks in an attempt to establish, even control, delivery channels. While the results of vendors' strategies will not be known for some time, what is known is that vendors must adapt the structure of their service business as the market rapidly changes if they are to remain competitive.
- The purpose of this report is to identify trends in the telecommunications service market, to explain how these trends will affect the overall market, and to suggest strategies that may help INPUT's clients take advantage of the opportunities that are likely to unfold as the market changes.
- This volume is divided into five sections:
 - The Executive Summary presents a brief overview of the most prominent findings and recommendations of the report.

- The Telecommunications Service Market Analysis provides a financially-oriented overview of the telecommunications, third-party maintenance (TPM), and total service market (including computer services) for the forecast period 1985-1990.
 - The Impact of User Service Requirements section reviews user requirements for service and identifies likely user reactions to various vendor service strategies.
 - Telecommunications Service Issues discusses the specific trends affecting hardware and software maintenance, professional services, educational services, and pricing of services.
 - Conclusions and Strategic Recommendations presents strategic alternatives that may help vendors exploit both the issues and opportunities that are a part of the marketplace.
- The information in this report was based on interviews with and comments from 162 telecommunications users, managers, and planners as well as extensive interviews with 53 of the leading service vendors in the U.S. The questionnaires used in these interviews are included in Appendices A and B.
 - In addition to primary research, numerous secondary sources were used for background information. These sources included annual reports, 10K reports, articles from professional journals and the trade press, and previous reports included in INPUT's Customer Service Program (CSP). The reader may wish to refer to these latter reports, specifically:
 - Market Analysis and Forecast--Large Systems.
 - User Service Requirements--Telecommunications.
 - Service Vendor Profiles--Telecommunications.

- Future Influence of Technology on Customer Service (CSP/Europe).
- Ten Newer Ways to Run Customer Service (CSP/Europe).
- Meeting the Challenge of Declining Revenue (CSP/Europe).

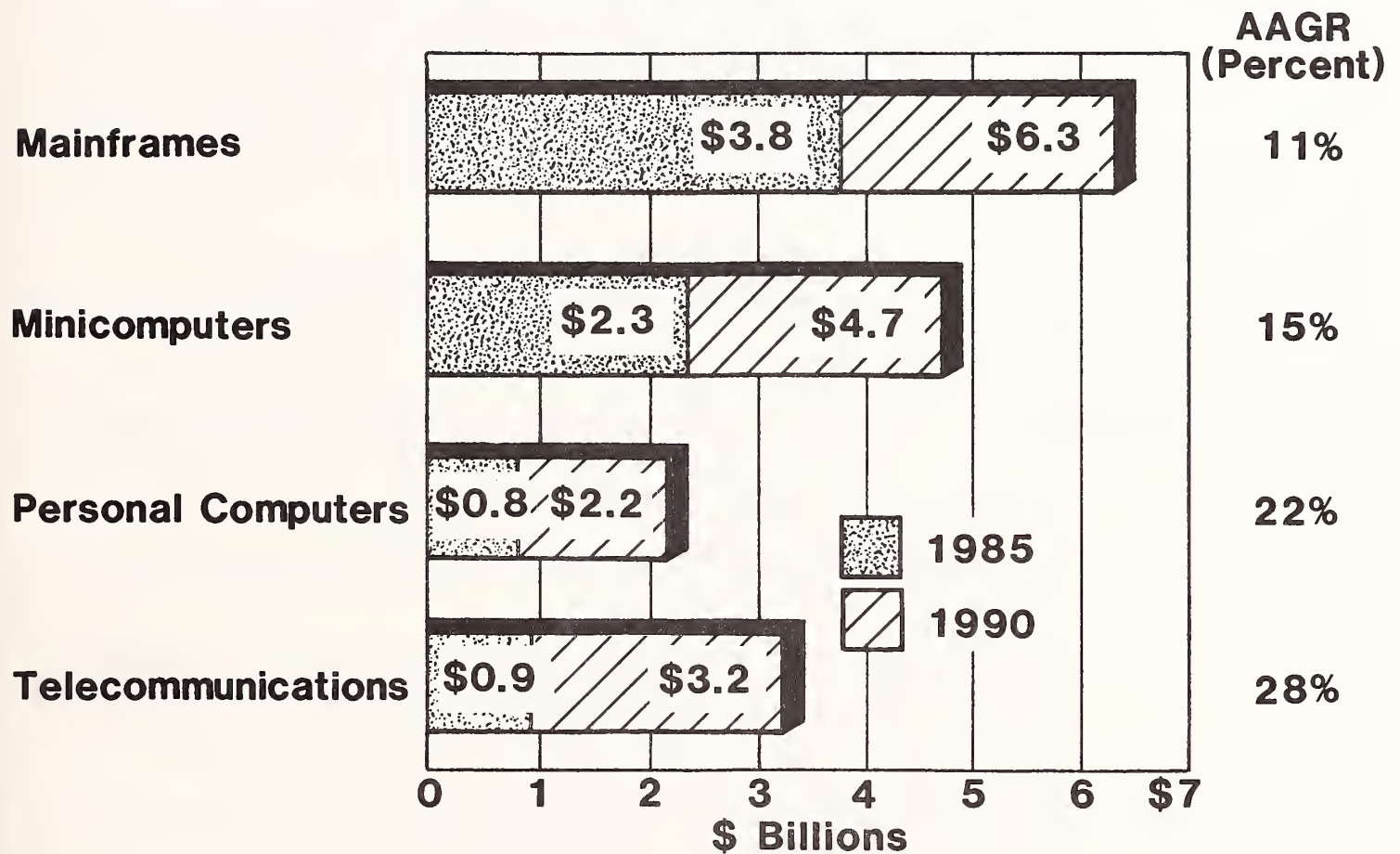
II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- This Executive Summary is structured in a presentation format to provide the busy reader with a quick and orderly review of the key research findings and strategic recommendations of this report. Main points are summarized in exhibits on the right-hand pages and accompanied by text highlighting that exhibit on the facing page. The format is designed to facilitate use of the Executive Summary as an in-house overhead presentation.
- While still in its embryonic market state, telecommunications service shows signs of repeating the very phases that are transforming other computer service markets from loss leaders to pockets of profit. The goal of this study is to track these trends and then identify the long-term strategic directions that vendors may wish to employ to further exploit the revenue and profit potential that will result from this market in transition.

A. SERVICES REVENUE FORECAST, 1985-1990

- Through the mid-1980s the information services industry has witnessed dramatic increases in the number of end users and equally dramatic increases in corporate America's need for functional integration of data processing resources. Together, these forces have created a requirement for connectivity that is unlikely to abate before the end of the decade.
- A telecommunications capability is central to meeting this requirement, and with that comes the added requirement for vendor servicing of this capability. Accordingly, overall service revenue for telecommunications is expected to increase from \$0.9 billion in 1985 to \$3.2 billion in 1990, an average annual growth rate (AAGR) of 28%. While only the fifth-largest service sector of the seven monitored by INPUT, telecommunications will grow at the fastest rate.
- Slowing growth rates in some other service sectors and the need to protect an installed base from service competitors could force vendors, especially mainframe and minicomputer service vendors, into this telecommunications service marketplace.

INPUT[®]**SERVICE REVENUE FORECAST, 1985-1990**

B. THE CHANGING MIX OF TELECOMMUNICATIONS SERVICE

- The mix of telecommunications service will change during the forecast period, following the same path traveled by other service sectors as they moved from embryonic to mature businesses:
 - Hardware maintenance, while representing the major revenue generator through 1990, will increase at the slowest rate, 24% AAGR. The slower rate will be the result of advances in technology that push the telecommunications hardware availability rate nearer the 100% level.
 - Software maintenance and support (47% AAGR) will represent an increasingly important source of revenue, particularly as telecommunications moves from hardware-only to hardware/software product offerings. Software-defined networks (SDN), as just one example, target a growing requirement for more flexible systems that include usage information generators for network control and cost accounting.
 - An even more rapid rate (59% AAGR) will occur in professional services (planning, consulting, documentation, systems integration, facilities management) and educational services. Although these service areas represent a much smaller revenue contribution, they contribute greatly to customer satisfaction and future sales.

**THE CHANGING MIX OF
TELECOMMUNICATIONS SERVICE**

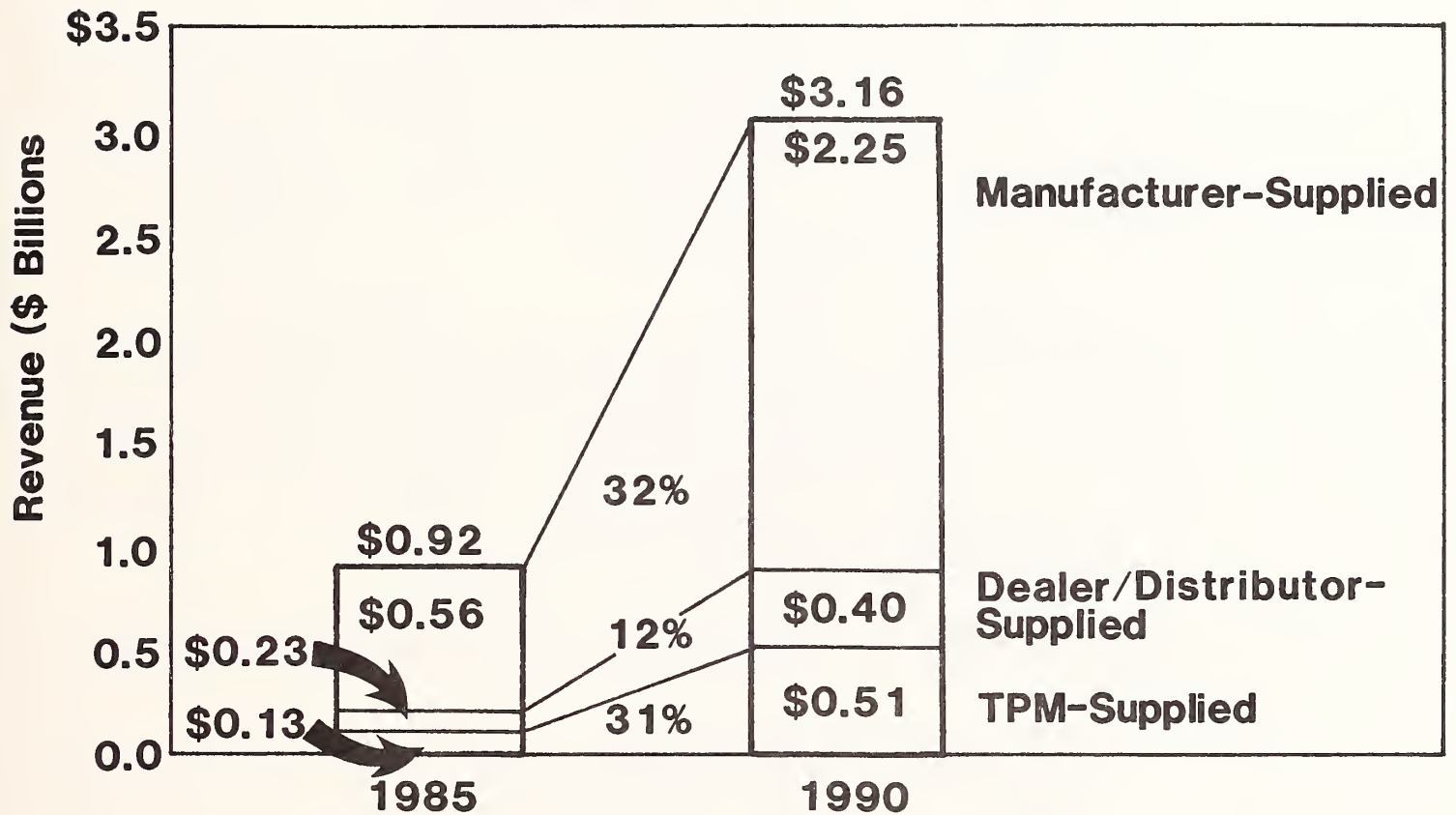
SERVICE COMPONENT	YEAR	
	1985	1990
Hardware Maintenance	92%	80%
Software Maintenance and Support	5	10
Professional Services	3	9
Educational Services	0	1

C. MANUFACTURERS GAINING CONTROL OF TELECOMMUNICATIONS SERVICE

- To service the rapidly growing telecommunications product base, manufacturers have relied on dealers, distributors, and third-party maintenance organizations rather than bear the tremendous costs of providing adequate service at a time when resources seem best used in manufacturing additional products.
- As the base becomes more controlled and as users exert more pressure for direct and improved service, telecommunications equipment vendors will take a more aggressive role in service.
 - Dealer- and distributor-supplied service will lose the most ground to manufacturers as manufacturers seek to regain account control without alienating dealers/distributors who will continue to be important retail channel outlets for products.
 - Third-party maintenance (TPM) revenue will grow at a 31% AAGR, but capture only a 16% share by 1990, up from the current 14% share. TPM growth will result primarily from leading vendors supporting networks with extensive planning, consulting, and software support. INPUT does not expect substantial additional encroachment in the telecommunications service market by data processing TPM vendors, but, according to a recent INPUT survey, over 65% of the top 100 TPM vendors are already servicing telecommunications equipment.
 - Other competitors may emerge, however. Some manufacturers, for example, are now emphasizing telecommunications/computer systems integration in office automation (OA) as a means of controlling OA accounts.

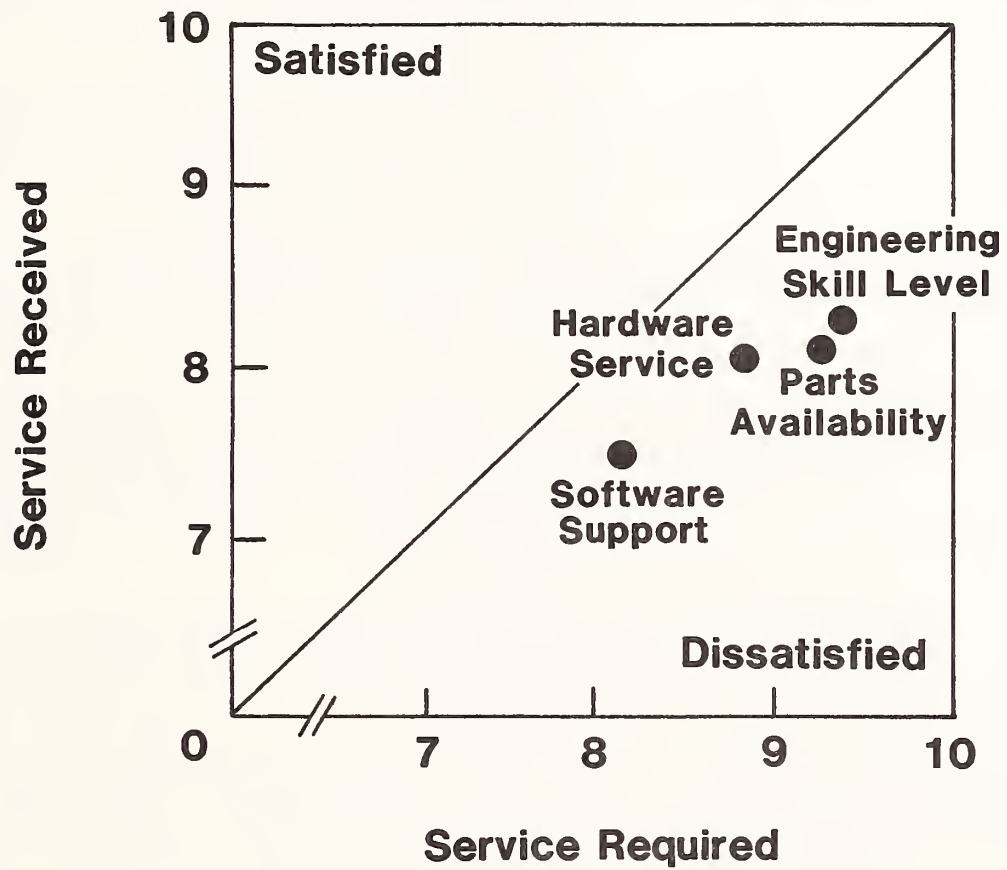
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MANUFACTURERS GAINING CONTROL OF TELECOMMUNICATIONS SERVICE



D. USER DISSATISFACTION WITH SERVICE

- The service requirements of telecommunications users are extremely--perhaps unrealistically--high and likely to remain so as users experience a growing reliance on the links that connect them with needed resources. Currently, users report dissatisfaction with many key service areas, including response time, repair time, parts availability, and FE skill level.
- Dealing with high user expectations, however, is a two-edged sword for vendors. Ignoring these expectations results in even higher levels of dissatisfaction and, most likely, loss of revenue as users turn to other vendors. But vendors cannot afford to meet every user demand, particularly capital-intensive service such as parts availability.
- The most advantageous approach is to increase users' perceived importance of low-priority services (planning, consulting) which, in turn, moderates expectations for high priority services. This is not to imply that users will tolerate a lack of spare parts or poorly-trained FEs. Rather, overall ratings can be improved by emphasizing secondary services.
- These strategies can be profitable as well. Some specific examples include:
 - Unbundling services forces users to acknowledge the value of the service, and the higher the value, the more likely the service will impact on satisfaction.
 - Encouraging users to quantify service needs forces them to identify realistic, rather than ideal, service delivery. If needs are truly above average, premium prices should be charged.

USER DISSATISFACTION WITH SERVICE

E. TRENDS IN TELECOMMUNICATIONS SERVICE

- As the equipment market has developed, telecommunications manufacturers, unlike data processing vendors, have relied primarily on distributors for sales and service. In addition to giving up account control and service revenue, these manufacturers suffered the liabilities of growing user dissatisfaction with the kind and quality of service being provided.
- To recapture accounts and service revenue, these vendors are expanding their direct service offerings and, at the same time, expanding their direct sales/service efforts to large, influential national accounts.
- As manufacturers continue their competitive efforts, other vendors are developing strategies to gain or retain service revenue by expanding their service offerings, primarily by providing software support, professional services, and education and training. Unfortunately, vendors' expansion plans cannot be funded by service price increases for fear of an adverse reaction from both the user base and the competition.
- A solution to this squeeze may lie in reducing the cost of service delivery. Use of remote support and encouragement of user involvement in maintenance attempt to reduce the high cost of on-site support. Early efforts on both fronts have met minimal user resistance, primarily because users want to be involved and appreciate any improvement in service.

TRENDS IN TELECOMMUNICATIONS SERVICE

- **Growing Level of User Dissatisfaction**
 - **Struggle for Account Control**
 - **Expansion of Service Offerings**
 - **Reduction in Service Delivery Costs**
-

III TELECOMMUNICATIONS SERVICE MARKET ANALYSIS

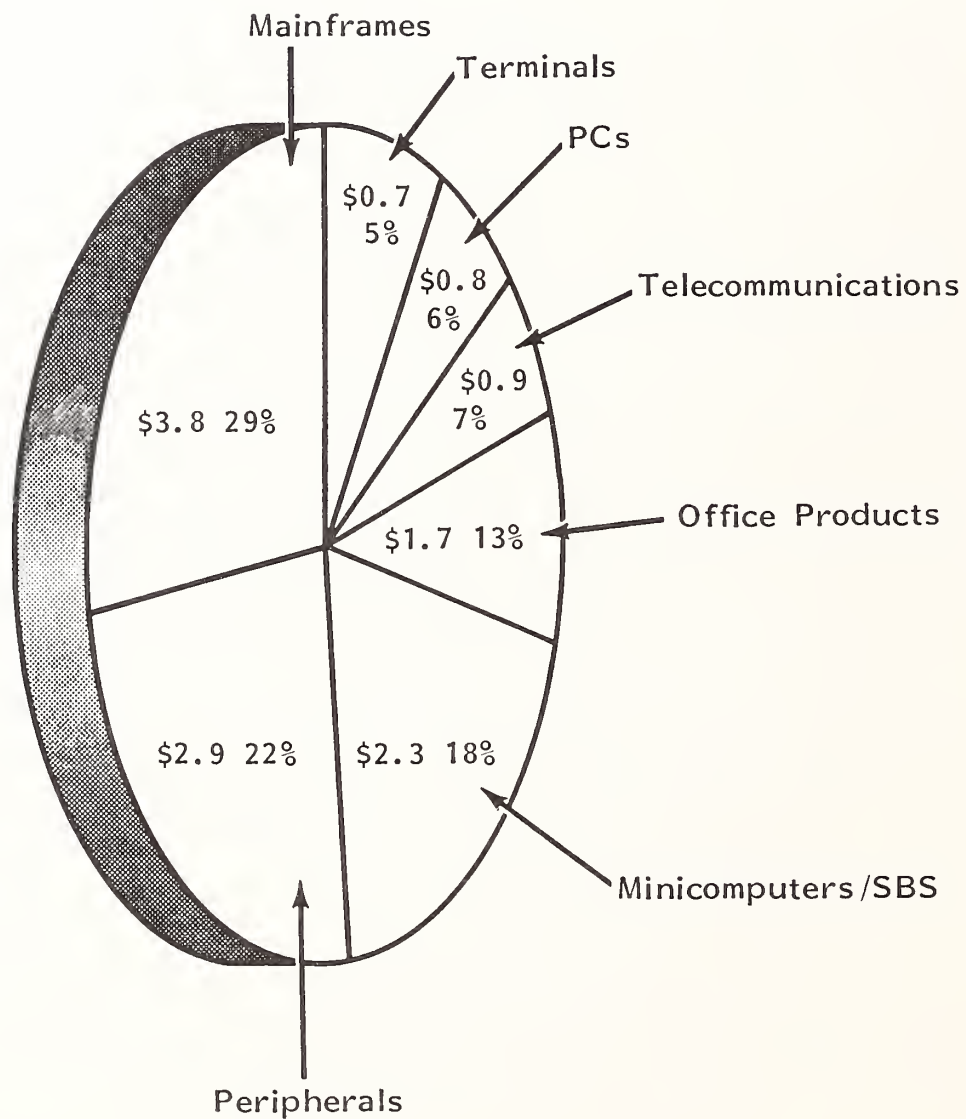
III TELECOMMUNICATIONS SERVICE MARKET ANALYSIS

A. TOTAL SERVICE MARKET REVENUE, 1985-1990

- U.S. computer service market revenue totaled \$13.2 billion in 1985 and is expected to grow to \$28.7 billion in 1990, an average annual growth rate (AAGR) of 17%.
- While the dependence of service vendors on equipment sales is well established, vendors are identifying new sources of service revenue (consulting, planning, site management, sale of supplies, service guarantees, etc.) to offset the moderation in shipments growth to 12% AAGR through the remainder of the decade.
- Exhibit III-1 depicts the market share held by each service sector in 1985 and Exhibit III-2 depicts the results of the realignment of market share that will occur during the forecast period.
- As competitive pressures restrict service price escalation in the mainframe market, other market sectors, most notably PCs, office products, and telecommunications, will increase in total share.
- Exhibit III-3 summarizes the revenue picture by service sector and adds INPUT's average annual growth rate forecast.

EXHIBIT III-1

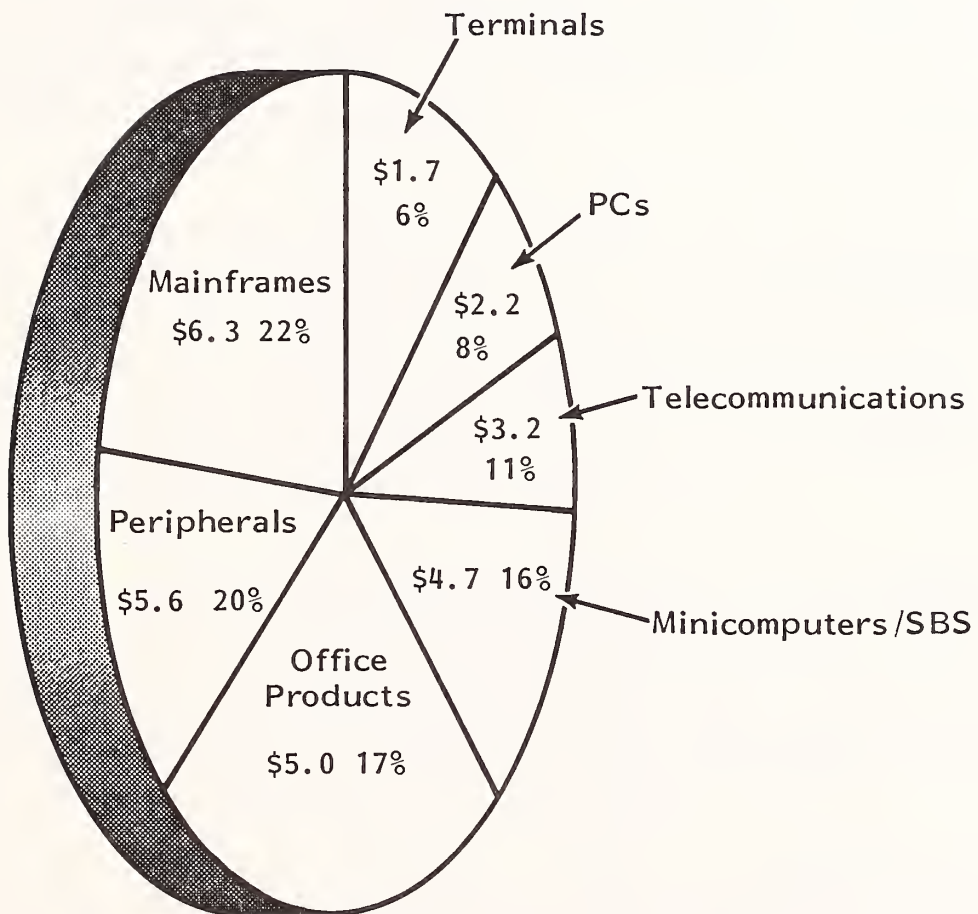
1985 U.S. CUSTOMER SERVICE REVENUES
(\$ Billions)



Total U.S. Service Revenue in 1985: \$13.1 Billion

EXHIBIT III-2

1990 U.S. Customer Service Revenues (\$ Billions)



Total U.S. Service Revenue in 1990: \$28.7 Billion

EXHIBIT III-3

U.S. SERVICE REVENUE FORECASTS, 1985-1990

PRODUCT SECTOR	1985 (\$ Billions)	1990 (\$ Billions)	AAGR *
Mainframes	\$ 3.77	\$ 6.32	11%
Minicomputers/ Small Business Systems	2.31	4.73	15
Peripherals	2.89	5.56	14
Terminals	0.75	1.72	18
Personal Computers	0.81	2.20	22
Office Products	1.70	4.98	24
Telecommunications	0.92	3.16	28
Total	\$13.15	\$28.67	17%

*AAGR = Average Annual Growth Rate

- While mainframe service will shrink as a percent of the total service market, this sector will remain a vital and influential aspect of the industry, capturing over \$6 billion in service revenue. This sector is important beyond the initial revenue it generates in that control of the user's CPU service is essential to prevent customer base erosion in peripherals, terminals, and software service and support.
- Minicomputer/small business system service is growing at 15% annually, but will lose shares to other, faster growing product sectors by 1990. Within the minicomputer sector, service on superminicomputers and new, low-end systems is expected to grow rapidly while service growth on traditional 16-bit systems is expected to remain stable.
- Annual growth in the terminals and peripherals market will be limited to 18% and 14%, respectively, through 1990. Terminals will remain one of the smallest service markets and will be subject to internal competition from regional third-party maintenance vendors. Peripherals service revenue growth is overshadowed by the fact that this will be a \$5.6 billion market by 1990, second in size only to the mainframe service market.
- Personal computer service will continue to grow at a rapid rate (24% AAGR) despite falling maintenance prices on individual machines. Increased competition from TPM vendors and manufacturers will result in a lower market share for retailers and dealers. However, the continued growth in equipment sales will more than make up for lower service prices.
- The office products service market (excluding PCs) will show steady growth in revenue reflecting growth in the market as a whole. INPUT believes that users in this market will demand a high level of software and hardware support due to their relative inexperience in data processing. Overall, the office product service market will represent 17% of the total service market by 1990.

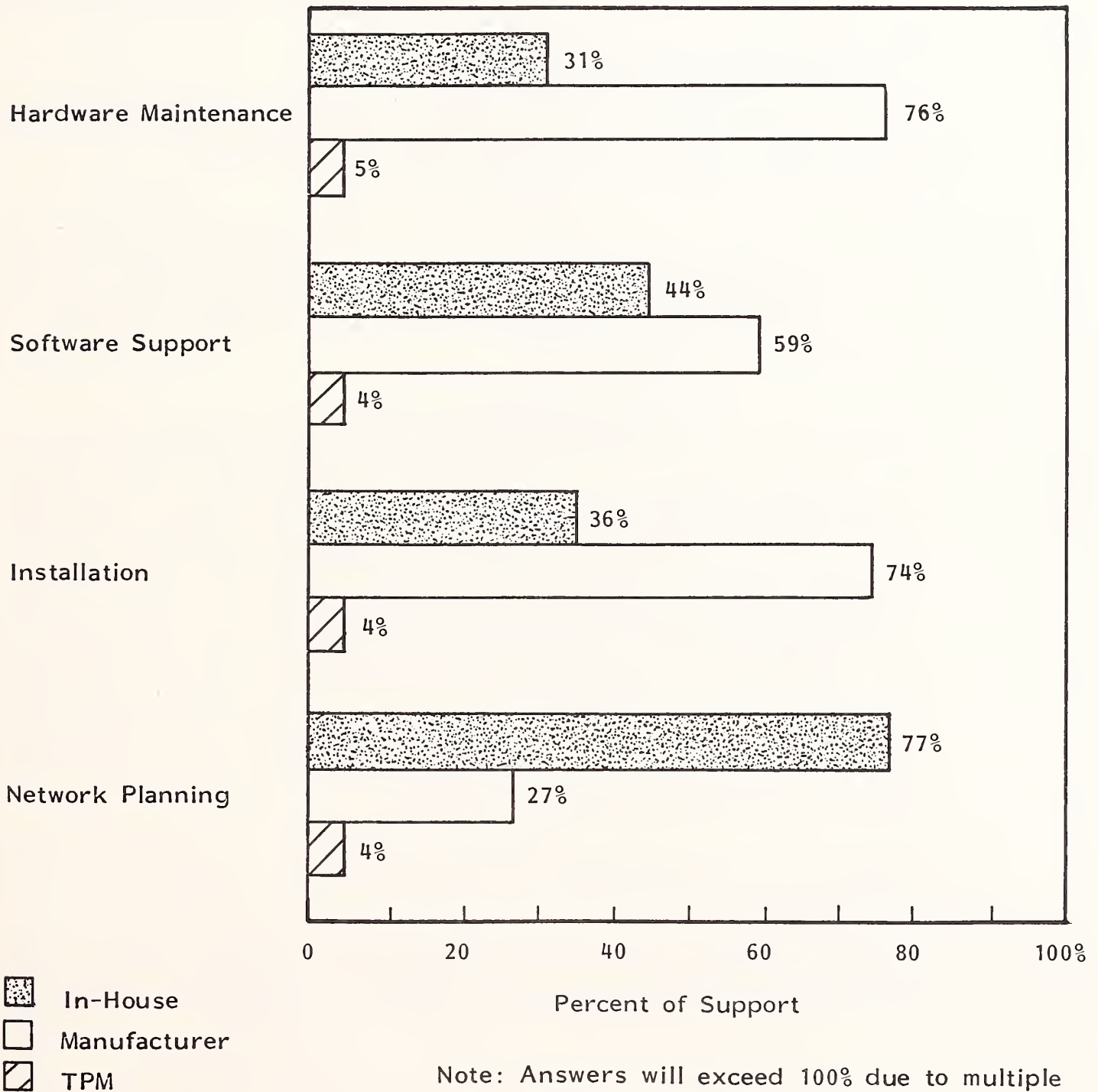
- Telecommunications is expected to have the fastest annual growth rate (27%) between 1985 and 1990. Growth in this market will be spurred by user demands for network services and the increasing interaction of telecommunications and data processing products. As a result of this rapid growth rate, the market share of the telecommunications service sector will increase from 7% in 1985 to 11% in 1990.

B. TELECOMMUNICATIONS SERVICE MARKET REVENUE, 1985-1990

- Service revenue derived from telecommunications typically suffers from a relatively long product life cycle and high degree of reliability. But through 1990, these factors will be offset by the rapid integration of data processing and communications functions. The desire to integrate functions and achieve increased connectivity, primarily as the result of an ever-increasing end-user population and the demand for the transfer of shared resources, will drive telecommunications equipment, sales, and services to new highs.
 - The rate of telecommunications equipment shipments is expected to be the third fastest, behind terminals and peripherals. The service-to-sales revenue rate will climb from 14.6% in 1985 to 24.4% in 1990.
 - This increasing rate signals the strong user dependence upon the functionality of communications equipment for the integrity of transferred information. User requirements will remain high and lead to almost unlimited potential for the support and service of telecommunications.
- The potential may be larger than that forecast due to the fact that over 40% of users' telecommunications support budgets is for internal support (see Exhibit III-4). Generally, this support is internal when users cannot find satisfactory service from a vendor.

EXHIBIT III-4

TELECOMMUNICATIONS SUPPORT SERVICE DISTRIBUTION



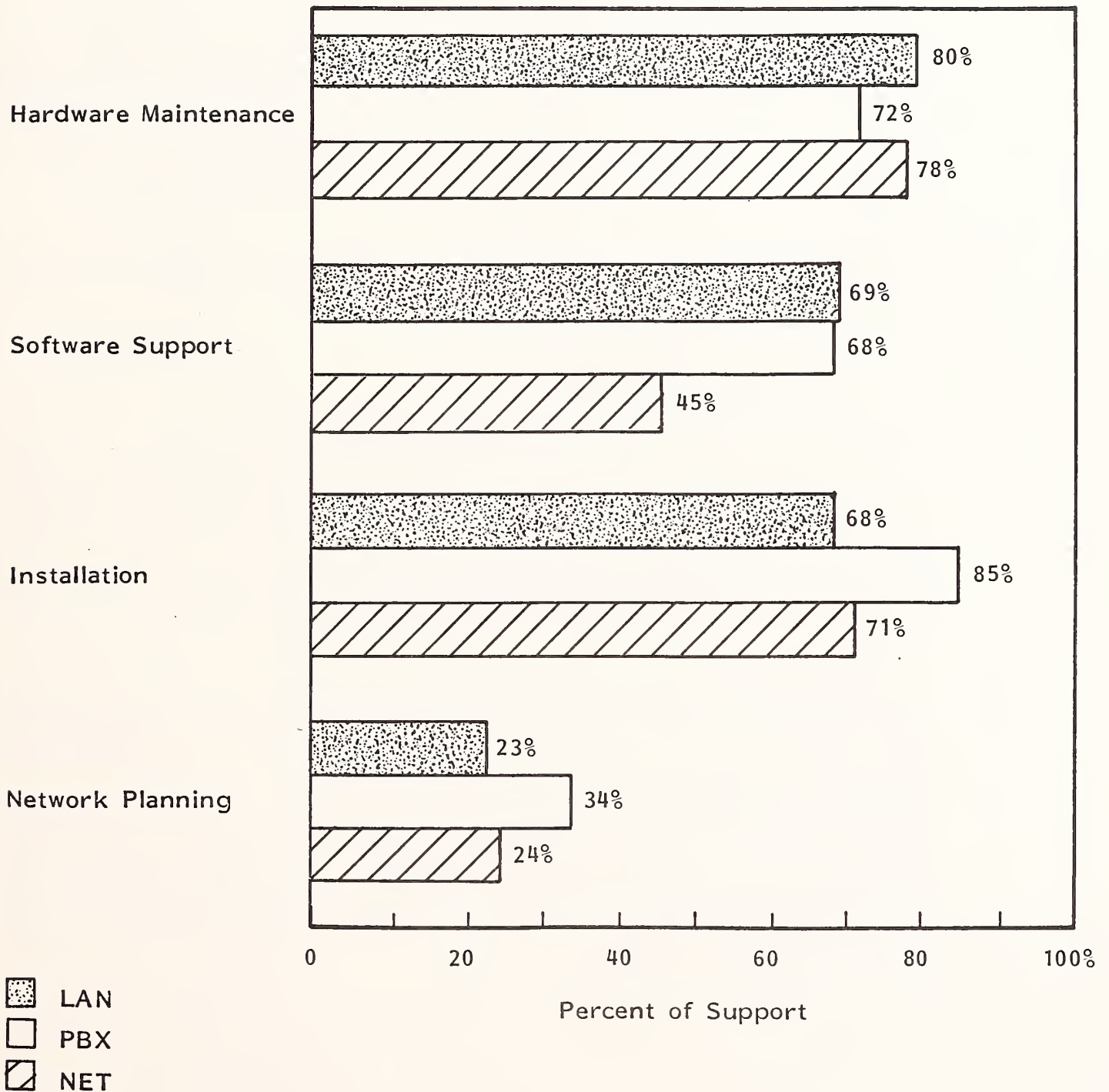
- Telecommunications is not a homogenous market, however; it ranges from digital data switches to modems to earth stations to local area networks. In fact, the submarkets within telecommunications are very different and sharply defined, with only one common characteristic--huge growth potential and excellent strategic value.
 - Products in this market offer high reliability and therefore yield higher margins.
 - The extent of the reach of telecommunications and the extent of use it receives offer the potential for high volume contracts.
 - The increasing dependency generally translates into high demands for service and lower price sensitivity, allowing service vendors, primarily manufacturers, to leverage service revenue to achieve profitability or additional equipment sales.
- Experience in other service sectors has taught vendors to be less dependent on new equipment sales as the only method of increasing sales. New sources of revenue such as supply sales and add-on services (standby equipment, guaranteed uptime options, consulting, education, etc.) have now become a part of successful vendors' offerings. The maturing telecommunications service market will call for these additional offerings as well. This changing mix of services, depicted in Exhibit III-5, will nearly mirror the industry as a whole by 1990 when the mix is forecast to be 81% hardware maintenance, 11% software maintenance, 5% professional services, and 3% educational services. These services are discussed below.

I. HARDWARE SERVICE TRENDS

- Hardware maintenance will continue to dominate this service sector, but will lose share to other services, primarily software maintenance and professional

EXHIBIT III-5

DISTRIBUTION OF SERVICES BY SOURCE



services (needs analysis, planning, consulting). Still, hardware maintenance will reflect a 24% AAGR through the forecast period.

- This growth will be realized primarily from market expansion, rather than price increases. In fact, service prices through the period will begin to show a decline as the result of several interrelated factors (see Exhibit III-6).

a. More Reliable Equipment

- Manufacturers continue to make technological advances that lower the cost of both producing and servicing products. And, these advances tend to result in more reliable equipment. While advances are providing some margin for service, the competitive nature of this sector forces price cutting.
- Vendors may need to use the technical advances they make to increase margins and lower costs.

b. Growing Price Sensitivity

- Users perceive that service pricing in the telecommunications market should cost less than it does in other markets, primarily the large systems market that is frequently used as a benchmark. From the users' point of view, telecommunications, by its very nature, requires less "hand holding" (on-site engineers, parts, rigid escalation and dispatching procedures, etc.).
- This is currently mitigated by the growing user demand for telecommunications and the growth in telecommunications applications. This dependence increases user perception of the value of service required to maintain equipment and makes them less price sensitive. In fact, service is a leading selection criteria used by potential customers. Their dependence has so far stalled the onset of price sensitivity that tends to occur as service markets mature. But this will change.

EXHIBIT III-6

PRESSURES TO MODERATE HARDWARE SERVICE PRICES

- More Reliable Equipment
- Increased Cost Containment
 - Improved Remote Support
 - More User Involvement in Services
 - Modular Parts Replacement Rather than On-Site Repair
- Growing User Price Sensitivity
- Price as a Competitive Weapon

- Hardware prices will continue to decline and users will expect service prices to fall in line with the hardware.
- As equipment becomes more reliable, users will become more reluctant to spend ever-increasing amounts for fewer required services. Customers will expect vendors to "hold the line" on service prices because they believe service costs should fall as a result of fewer service calls.
- This will not be, as many vendors think, a temporary aberration in escalating prices.

c. Price As a Competitive Weapon

- Increased serviceability of equipment resulting from improved modular design, remote support, and redundant systems could lower costs and permit more competitive pricing.
- Manufacturing may eventually use service pricing on older models as leverage for upgrades. This is a place TPM can assert itself.
- In a period when the perceived value of service is high and the customer is less price sensitive, vendors may encounter substantial pressure from within the organization to increase service prices and improve profitability.

2. SOFTWARE SERVICE TRENDS

- A quick look at the seven-layer Open Systems Interconnected reference model for a general communications network advanced by the International Standards Organization indicates that succeeding higher levels become more software intensive and host dependent. Only the lowest levels, Physical and Data Link, have reached the final stage of standardization, with the higher levels currently composed of de facto protocols or yet-to-be adopted

standards. But as the telecommunications industry progresses, software is sure to become central to the capability.

- Accordingly, INPUT estimates that software service revenue will increase dramatically (47% AAGR) and become a \$320 million market in 1990. This growth will be primarily fueled by the increasing integration of telecommunications and data processing.
 - The availability of software-defined network (SDN) products from such vendors as AT&T (SDN), MCI (V-Net), and U.S. Telecom (Virtual Private Network) provides examples of the future of this integration effort. Briefly, SDN combines the concepts of leased lines and switched networks. Users lease access to a network at a local level. These access points are connected to form a network based on user needs (similar to a local PBX, but on a national level). Call processing, address translating, and routing are stored in a data base which is interrogated during the processing of a call. SDN allows greater flexibility and such features as call-dated information, fine tuning from a microcomputer, and "what-if" analyses not generally included in other network architectures.
- With the growing telecommunications data processing integration will come user requirements for software and service. And with that increased requirement will also come a willingness on the part of users to pay premiums for improved software support. As this software complexity increases, users will defer more and more to the service vendor's software support organization if that organization has the capability to meet the user's needs. The forecast period should witness steadily increasing prices as vendors capitalize on this demand.

3. PROFESSIONAL SERVICES TRENDS

- Professional services, such as consulting, planning, needs analysis, and site management, is a relatively small market but is growing rapidly (59% AAGR) and is expected to have a sizeable impact on telecommunications services with an estimated \$28 million revenue guaranteed in 1990. Professional services will be increasingly required as users adapt to multi-systems environments and seek additional functionality (distributed processing, micro-to-mainframe applications, etc.) in a multivendor environment.
 - The importance of professional services is not centered around revenue alone, however. A number of vendors report that professional services such as consulting and planning are important primarily because of their effect on other factors such as the purchase of equipment and additional services. INPUT believes that the ability to influence customer decisions is the main benefit of expanded professional services offerings.
- Pricing in this market is unlikely to increase dramatically, but profit margins should grow, primarily as the result of increased revenue from unbundled service at a time when the service costs are only gradually rising. This scenario could change, however, as manufacturers look to professional services to differentiate themselves from hardware-only services vendors and as they drop prices as a means to that end. Costs could escalate as vendors are required to become proficient in a multivendor environment.
- Service vendors will eventually be forced to unbundle a number of services to remain price competitive and to accurately assess the costs of individual services. By unbundling non-essential services, vendors hope to accomplish a number of objectives:
 - To increase revenue by charging for services which were previously included in basic support contracts.

- To improve user perception of service flexibility by providing more service options.
- To enhance the manufacturer's competitive position, particularly in relation to TPM vendors, by maintaining low basic service prices with an option for higher levels of service depending on the individual user's requirements.
- To underscore the importance of professional services as a separate and identifiable service option.

4. EDUCATION AND TRAINING SERVICE TRENDS

- Education and training services will not be a significant revenue generator during the forecast period although it will grow from minimal revenue in 1985 to \$30 million in 1990. Demand will be stimulated by the continuing penetration of telecommunications and the resulting need to train users in its utilization and application. A variety of training mediums will be employed with live instructing most common, videotape and paper-based systems second, and computer-aided instruction/computer-based training (CAI/CBT) third.
- Vendors are likely to continue to "give away" these services since doing so not only engenders good will and increases user satisfaction, but also increases demand for and usage of telecommunications which, in turn, increases the requirements for service.

C. TELECOMMUNICATIONS SERVICE VENDORS

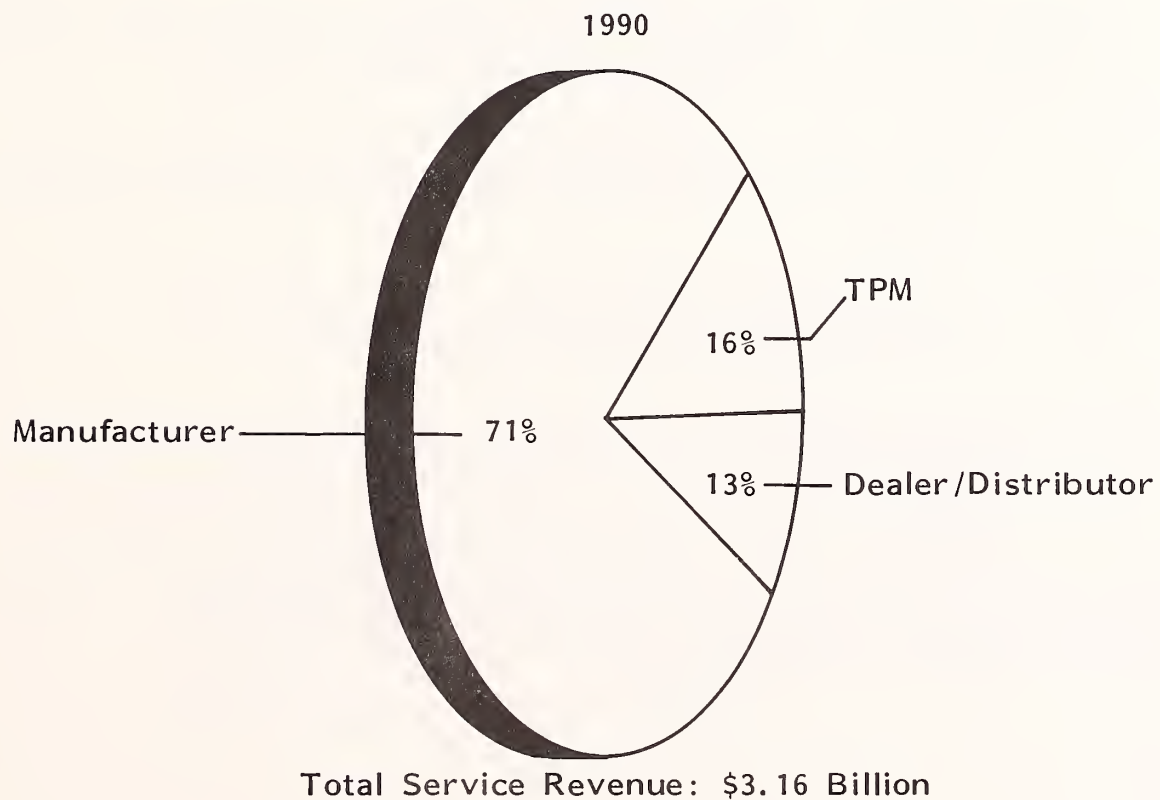
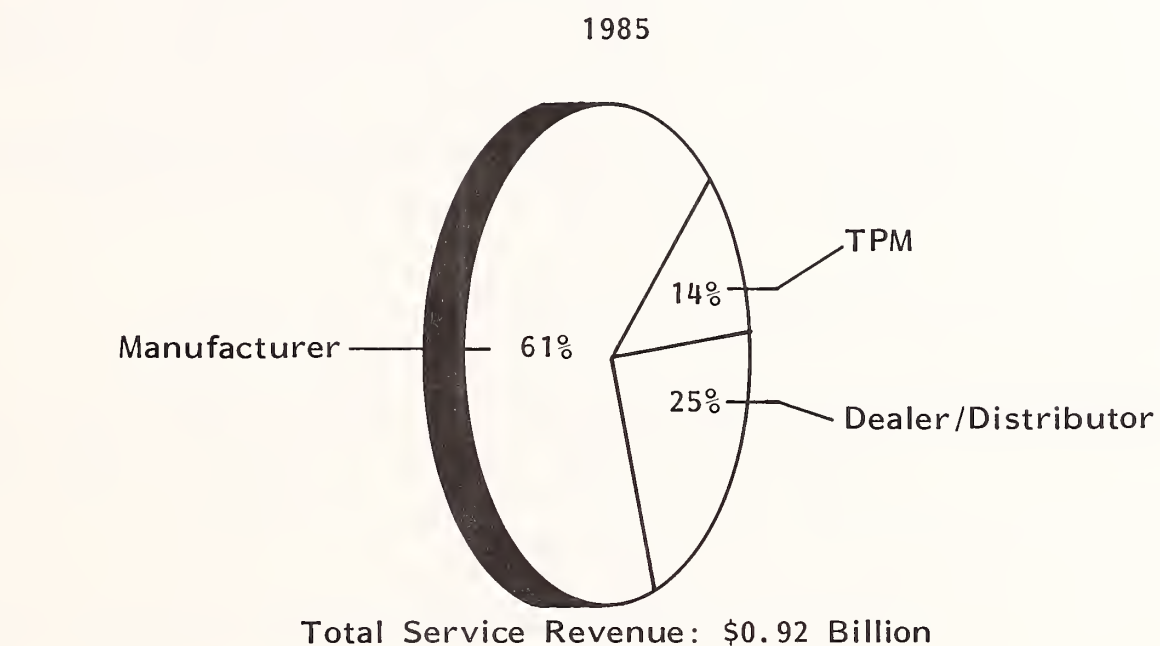
- Revenue for service provided by dealers/distributors will grow at a modest 12% AAGR compared to a 27% rate for manufacturers and a 31% rate for

third-party maintenance (TPM) vendors. The net result will amount to a near-75% market share for manufacturers in 1990 (see Exhibit III-7). Competition from established telecommunications vendors (e.g., Northern Telecom, Regional Bell Operating Companies) will be intense and daunting to even the largest of the traditional service vendors. Still, explosive growth in this service sector will make this market a major revenue producer for third-party maintenance vendors.

- As shown previously in Exhibit III-4, users report a distribution of services by source as follows:
 - Seventy-six percent of the respondents said that hardware maintenance was left primarily to the manufacturer or vendor, 59% said they left software support to that group, and 74% stated they entrusted installation to either the equipment or software manufacturer or vendor. Only in the case of network planning were the majority of the support services left resident in-house, with 77% of the users saying they performed this service in-house.
- Manufacturers traditionally view service in the embryonic stages of a market as a "necessary evil." The customer base in this stage is rapidly expanding, but is still dispersed and uncontrolled. The high cost of servicing this market forces manufacturers to use dealers, distributors, and TPM vendors to service equipment.
- While competition from manufacturers is less in the early stages, these alternative vendors, especially TPM vendors, find it to be a tough market.
 - Since the installed base is not large and the user population not dense, establishing a sufficient service base, even on a regional level, is more difficult.

EXHIBIT III-7

MARKET SHARE BY TYPE OF TELECOMMUNICATIONS SERVICE VENDOR



- The newness of the equipment and its rapidly changing technology limits the availability of parts to manufacturing services rather than from alternative services such as salvage and after-market manufacturing.
- Diagnostic procedures are not readily available or easily established on newer equipment and remote diagnostics are generally not an interest until long after the manufacturer's own remote support is available.
- It is difficult to use the key strategy of lower price that is historically used by hardware-only service vendors.
 - . Users are not price sensitive.
 - . Manufacturers have not raised service prices as they traditionally do on other equipment as a strategy to induce hardware sales.
 - . A steady stream of new products requires constant FE training.
- Manufacturers eventually assert themselves in the newly defined and segmented service market as the result of several factors.
 - Growing product densities provide opportunities for a profitable service business.
 - Users exert pressure for more direct service.
 - Users require improved services that may include full service total support that cannot be offered by hardware-only maintenance vendors. Users look to the telecommunications manufacturer for guidance in network planning and the integration of incompatible systems at the user's site.

- Equipment sale revenue begins to fluctuate, and the seemingly "recession-proof" services business can stabilize revenue.
- Service becomes important both as a means of containing erosion of the installed base and for account control that leads to potentially more profitable add-on sales and service.
- As manufacturers "re-enter" the market, they tend to employ a variety of strategies that result in rapid growth in service revenue and, eventually, dominance in the market.
 - Promotion as a single source of service (hardware, software, professional services, education) for the manufacturer's equipment and, in the long run, a full-service supplier for the user's multivendor environment.
 - Unbundling of services that not only lowers the price of "basic" services, but also provides additional revenue, some of which is at premium prices.
 - Competitive prices that are the result of a growing volume of service business and operational efficiency (e.g., remote support and tele-marketing activities that reduce the most expensive component of service, the on-site call).
 - Introduction of new products that not only advance technology but threaten the very survival of service competitors.
- To combat these strategies, third-party vendors need to identify and exploit such market niches as:
 - Users of obsolete equipment (or older equipment that is not compatible with newer equipment) where service is otherwise not available or the manufacturer is not price competitive.

- Price sensitive users who believe the manufacturer's "competitive" prices are still too high.
 - Users who require better-than-average response/repair time. (TPM vendors that can improve on response time either through advanced diagnostics or geographic proximity may have a substantial advantage because telecommunications is such a high priority area for many users.)
 - Users who require planning, consulting, and software support that is extensive and beyond the scope of other service vendors. (Only a few leading vendors will be able to provide such extensive services, but this could be a lucrative niche as the most likely competitors, data processing TPM vendors, will not encroach on the telecommunications market.)
- The longer life cycle of telecommunications equipment should give TPM vendors time to train engineers, establish logistics operations, and seek out these niche markets.

IV IMPACT OF USER SERVICE REQUIREMENTS

IV IMPACT OF USER SERVICE REQUIREMENTS

- Perhaps the most important trend in the service market as a whole is the growing influence users are exerting on the vendor's service-related decisions. This user influence is growing as a result of two major factors.
 - Increased user sophistication regarding service (resulting from a growing dependence on their computer system).
 - A higher level of competition for service business from both the manufacturers and TPM vendors.
- Vendors must accept that the era of the passive service customer is gone and will, in all probability, never return. Users are becoming much more active in driving the market in areas like service pricing, flexible levels of support, response times, etc. While some vendors can take an imperious attitude and ignore user demands, the successful service vendor will attempt to understand the user's needs and design the company's programs around those needs.

A. MERGING OF VOICE AND DATA

- Users are realizing that the full utilization of telecommunications equipment includes both voice and data. The primary candidates for this merging of voice and data into a single operation will include conventional data

communications, message switching, and electronic mail. Thus, a diverse and well-trained support staff will be required to maintain and repair the different, often marginally-compatible equipment.

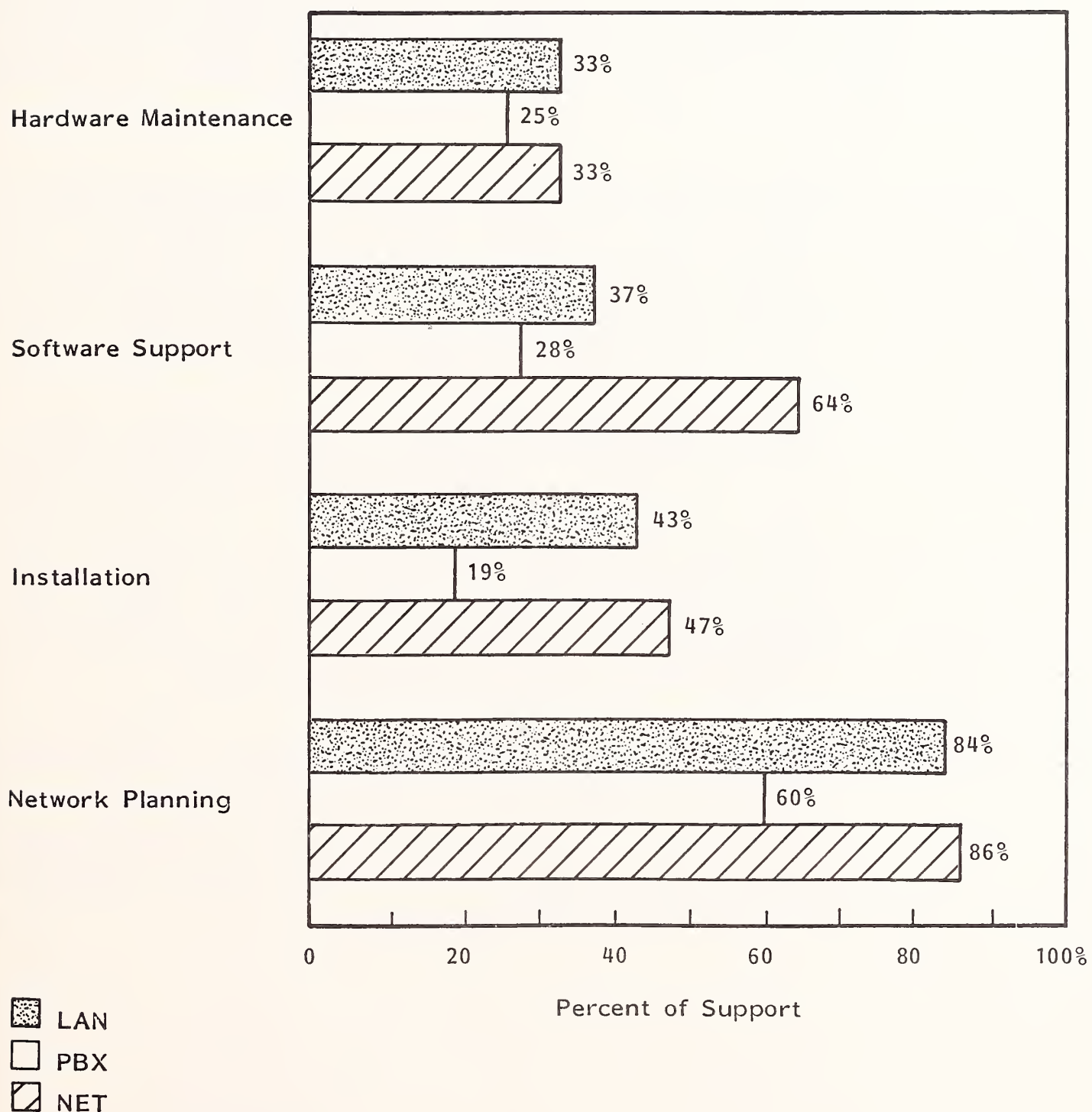
- In the past, voice and data were separate entities requiring separate facilities and supported by people with two distinctly different sets of skills. As the distinction between transmission capabilities of voice and data blurs, the support staff must be trained (and equipped) to handle both technologies, especially where the switch is involved.
 - Most PBX-equivalent switches used for voice and data are able to do so by virtue of "black-box" additions to existing technologies. In the next few years, such switches will have been specifically designed to handle these merging technologies.
 - Telephone company experience will no longer be a prerequisite for hiring support personnel, but rather computer and data transmission experience and knowledge.

B. USER INVOLVEMENT IN SERVICE

- Self-maintenance started as a reaction to the lack of or expense of quality telecommunications service, as well as a means of satisfying the user's sense of involvement. Since then, user involvement has grown considerably with 46% of total service expenditures allocated to in-house activities.
 - As indicated in Exhibit IV-1, users of all types of equipment are involved, although PBX users are least likely to service their own equipment while network users exhibit the most amount of in-house support.

EXHIBIT IV-1

IN-HOUSE SUPPORT BY PRODUCT AREA



- As internal expenditures have grown, vendors have become concerned that the user's practice of supporting telecommunications products internally will have a dramatic effect on vendor revenue.
- Telecommunications users appear to be more willing to participate in maintenance operations than their data processing counterparts. In addition to the issue of necessity cited above, users participate more readily since products are generally less expensive than data processing equipment, making users less wary of damaging their entire system. However, self-service on products which are critical to the telecommunications system (LANs, PBXs) is much less likely.
 - LAN vendors in particular will be impacted as these vendors are frequently forced to address support in a multivendor environment through extensive planning and installation support, cabling, and education and training. As users develop expertise in these areas, their expectations for vendor-delivered service increase accordingly.
 - User self maintenance also threatens telecommunications vendors in the area of planning. Seventy-seven percent of telecommunications planning is performed in house, essentially out of the vendor's control. While a certain level of in-house planning is to be expected in areas such as needs and capacity analysis and project implementation, telecommunications manufacturers are at a definite disadvantage if they have no impact until the end of the planning cycle.
 - Software support is an area in which telecommunications users have been forced to develop their own internal support mechanisms or do without support. This is particularly hard on many telecommunications vendors because the type of software support developed internally is the most profitable for software vendors.

- Approximately 65% of the vendors interviewed who provided software support maintain "problem" data bases for software support. Although none of these vendors offer access to the data bases to the end user, the data base is commonly consulted by technicians for solutions to user-initiated problems.
- Education and training is a second potentially profitable software support area in which many users have become involved. Vendors are particularly concerned about loss of control in this area because it affects the end user population over which capitalization and initial expenditures for education "products" can be distributed.
- The majority of vendors interviewed by INPUT feel that the end user may play an important role in on-site telecommunications support. As Exhibit IV-2 demonstrates, almost all vendors interviewed indicated that they had a program to assist the user in providing service on their equipment. All but one vendor provided a support hotline to the end user (the one vendor that did not support the end user provided a hotline to distributors). In addition to diagnostic initiation, a significant number of users install their own equipment and are willing to swap modules.
- INPUT expects continued user involvement in telecommunications support, particularly for low-end products such as modems, multipliers, and converters. Vendors have been very active in designing alternative maintenance plans such as mail-in/exchange programs, delivery service module swaps, and subsidized spare part plans for their products. Users have accepted these plans as the most cost-effective service delivery method for non-critical products.

EXHIBIT IV-2

USER INVOLVEMENT IN TELECOM SERVICES

100% of the vendors interviewed said that users did (or could) become involved in telecom maintenance. The most common user activities are:	
User Activity	Vendors Reporting (Percent)
Phone Support Hotline	95%
Initiating Internal Diagnostics	80
Installation of Equipment	45
Mail-In Modules	30

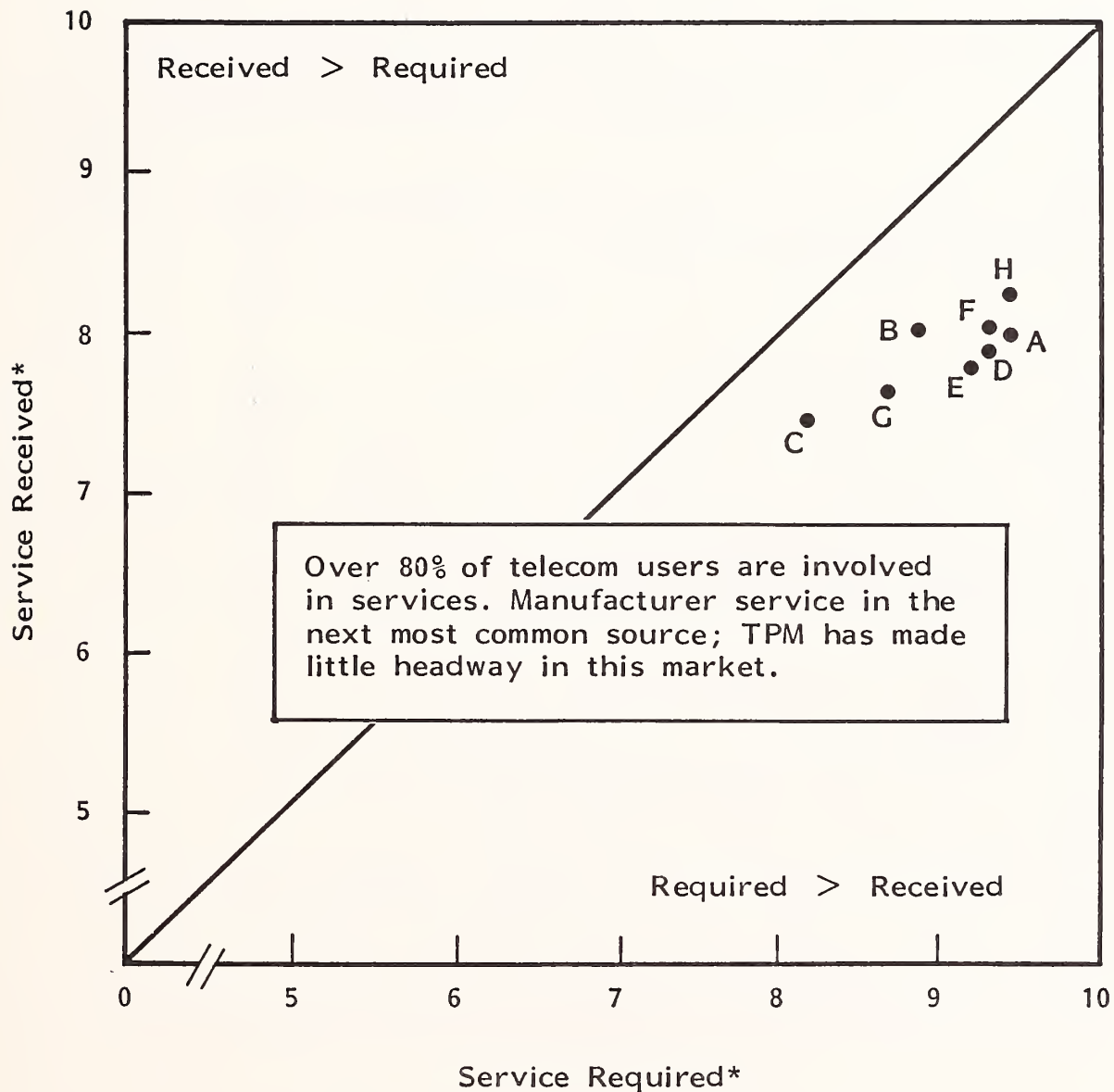
C. TELECOMMUNICATIONS USER SERVICE REQUIREMENTS

- The explosive growth in telecommunications usage has often left service and support issues lost in the resulting confusion. While telecommunications products are highly reliable by their very design, even the most reliable product is subject to downtime. In addition, the increasingly sophisticated "low-maintenance" products being used necessitate additional support services such as training, consulting, and planning.
- Given the extremely high (99%) system availability requirements reported by telecommunications users, it becomes increasingly important for vendors to improve their users' perceptions of, if not the actual performance quality of, their service.
- As in the data processing (DP) environment, user expectations for telecommunications service have been escalating rapidly. Even when users employ redundant systems (e.g., third generation PBXs), expectations for response/repair time frequently exceed data processing counterparts. User requirements for improved telecommunications service are particularly high in the areas of field engineering skills and vendor response time.
- INPUT believes that their expectations for services have been increasing as the result of three major factors.
 - The growing integration of voice/data communications.
 - Increasing reliance on telecommunications products.
 - User concern about the stability of the market as a result of deregulation.

- Exhibit IV-3 indicates that user perception of the value of service, represented by the relatively high user requirement levels, is quite high. On the other hand, user satisfaction with the level of service received is much lower than the user requirement level.
 - Overall satisfaction is relatively high (8.0 on a scale of 1 to 10 with 10 being the highest rating). Satisfaction with response and repair times is slightly less at 7.9 and 7.8, respectively. Response times are a frequent gauge of quality of support, even though the availability of replacement parts and technical skills are deemed of greater importance. If the vendor fails in this area, no amount of technical skill or parts will redeem the vendor/customer relationship from whatever damage is wrought by indifference to the user's need for prompt response and repair times. For these respondents, the difference between vendor response and repair times is greater than between any other categories.
- Actual performance by telecommunications vendors (see Exhibit IV-4) further illustrates the concern expressed by survey respondents, particularly in repair times. While prime time (Monday through Friday, 8:00 a.m. to 5:00 p.m.) system availability is quite high (96.5%), users' requirement levels approach an extremely high 99%. Overall system availability received versus required exhibits similar user/vendor differences.
- Although user requirements for system availability might be considered excessive, user requirements for response (4.2 hours) and repair (7.3 hours) are very realistic and quite achievable. Vendor performance, especially in the area of repair time, clearly suggest that improvements in service delivery need to be made. Improved serviceability in product design is one method generally accepted by telecommunications vendors, particularly increased remote diagnostics, remote fixes, and further development of redundant capabilities.

EXHIBIT IV-3

OVERALL VENDOR SUPPORT USER REQUIREMENTS VERSUS LEVEL OF SERVICE RECEIVED



- | | |
|--------------------------|-----------------------------|
| A = Overall Support | E = Vendor Repair Time |
| B = Hardware Maintenance | F = Parts Availability |
| C = Software Support | G = Problem Escalation |
| D = Vendor Response Time | H = Field Engineering Skill |

*Rating: 1 = Low, 10 = High

EXHIBIT IV-4

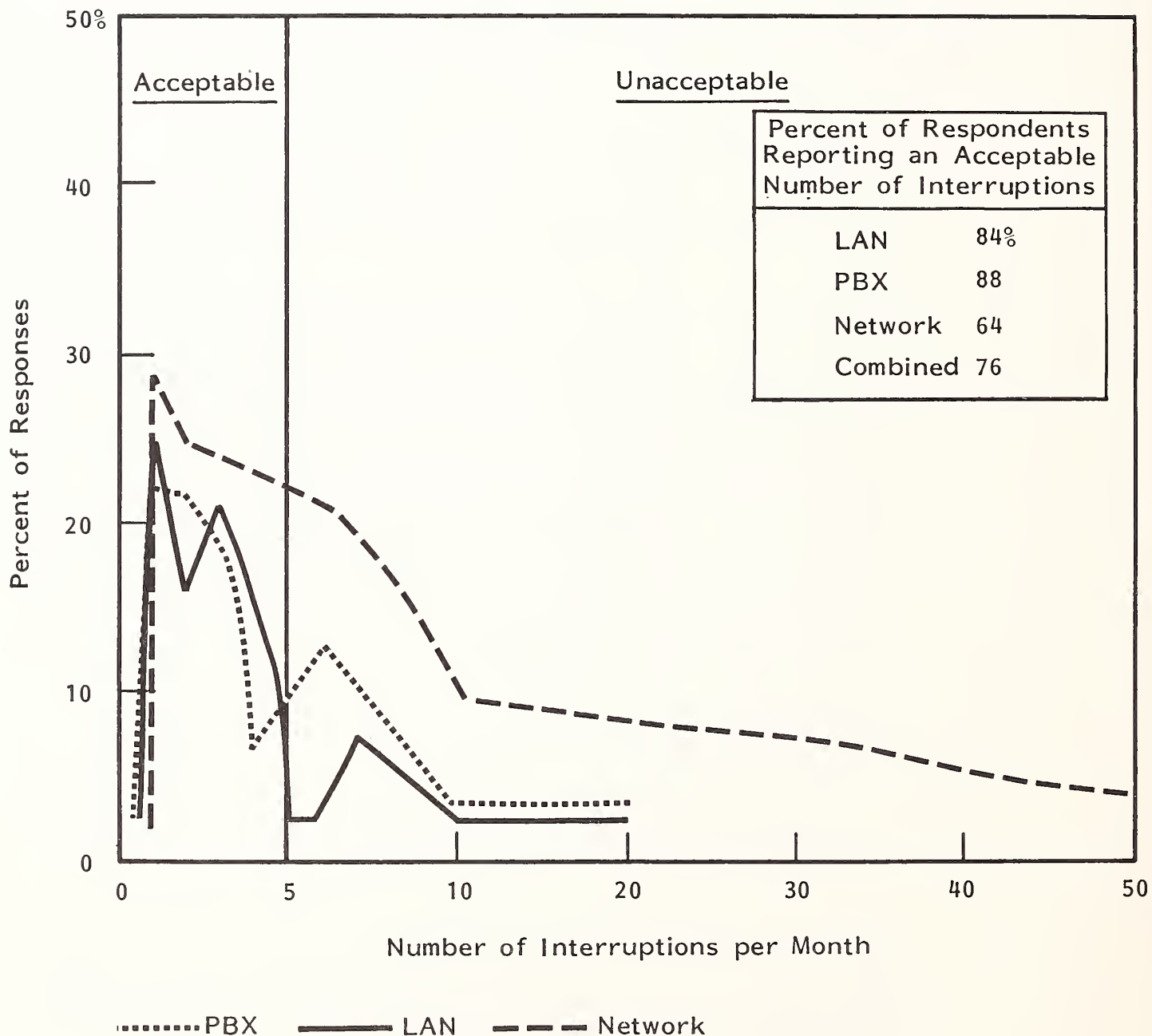
SERVICE COMPONENT DATA
OVERALL

SERVICE COMPONENT	EXPECTED	RECEIVED
Average Number of Software Interruptions per Month	-	2.3
Average Number of Hardware Interruptions per Month	-	3.4
Average Systems Availability	98.4%	95.9%
Average Systems Availability During Normal Business Hours (8am - 5pm)	98.9%	96.5%
Average Vendor Response Time (Hours)	4.2	5.9
Average Vendor Repair Time (Hours)	7.3	16.4

- The overall average number of software interruptions per month was 2.3 received and was 3.4 for hardware interruptions. Plotting the overall number of interruptions per month by the three different media (or products) produces the graph shown in Exhibit IV-5. The vertical line is the cutoff point between acceptable and unacceptable performance. The differential between LANs, PBXs, and networks shows networks far in front in number of interruptions per month. The fact that the network graph extends further out than does LANs or PBXs may be attributed to the inherent complexity of networks, providing more opportunities for failure. There is continued degradation of the graph as the number of interruptions per month increases.
 - A slight leveling off of the graph occurs at approximately 7 to 10 interruptions and then continues to decline as the number of responses to the survey decreases.
 - The value of this exhibit lies in the dramatic representation of the overall quality of service for LANs, PBXs, and networks. In-house staff, manufacturers and vendors, and third-party maintenance organizations all have some fence mending to do if they are to achieve and retain credibility in the service support area. The continued decline in service quality cannot be tolerated by the users indefinitely. Perhaps training is the answer and perhaps hiring better quality employees and stocking essential components is the solution. Whatever is the remedy, there is a crying need for its implementation.
- The current disparity between user requirements for service and vendors' actual performance suggests that vendors must focus on changing their performance levels or, more likely, users' perceptions of these levels. Vendors should attempt to increase user satisfaction using a two-prong strategy.
 - Make needed improvements in the service delivery structure, including better recruiting and training of service personnel, improved spares management, and more effective problem escalation procedures.

EXHIBIT IV-5

NUMBER OF INTERRUPTIONS PER MONTH



- Better educate the user base on service through existing service areas such as training and consulting. These service areas, often left to others as part of the sales function, are high visibility, high satisfaction services that increase user perception of the value of service received.

V TELECOMMUNICATIONS SERVICE ISSUES

V TELECOMMUNICATIONS SERVICE ISSUES

A. PHASES TO MARKET MATURITY

- As discussed above, the telecommunications service market shows every sign of proceeding through a series of overlapping phases not unlike those undergone by the more mature service markets for large and small systems. These phases and their implications for future changes in this market are presented in Exhibit V-I and discussed below.

I. RAPID EXPANSION OF THE INSTALLED BASE

- The early stage of the telecommunications market has been characterized by rapid expansion of the installed base of hardware. As indicated above, shipments are expected to continue at a fast pace through 1990 as manufacturers attempt to satisfy user hardware demands.
- Manufacturers' concentration on meeting this demand coupled with a notion that to speak of "service" suggests product fallibility has placed service primarily in the hands of dealers/distributors, TPM organizations, or the manufacturer's service center, the latter being more frequently a cost center than a profit center. In doing so, manufacturers have relinquished control over the quality of service and, in turn, user satisfaction. This focus has resulted in a discrepancy between user satisfaction and vendor performance.

EXHIBIT V-1

PHASES TO MARKET MATURITY

- Rapid Expansion of the Installed Base
- Manufacturers Begin to Take Control
- Price Becomes a Competitive Weapon
- New Technology Used to Cut Costs
- Vendors Offer Full Service

- The impact of negative results of less-than-expected service performance are heightened in the telecommunications service market.
 - With telecommunications a key link in the system and with the availability of that link visible to bodies of end users who depend on constant access, downtime is much more visible.
 - The growing interdependence of telecommunications and data processing confronts users with the complication of which vendor to call for service. Users are attracted by the notion of a sole source of integrated service and support, but find vendors unable (TPM vendors) or unwilling (manufacturers) to meet this need.
 - The selection and purchasing of voice and data hardware are being centralized at a corporate communications, information systems, or corporate administration executive level. Since the tendency is to give the data-oriented communications manager voice-related responsibilities (rather than vice versa), the issue of service appears to have increased in level of importance. Centralization also provides corporations with purchasing power that demands quality service and quantity discounts.
 - Users are also inclined toward self-maintenance, not so much to decrease service expenses but to meet requirements where service is not available from an external supplier.
- In this early stage, then, service vendors and manufacturers in particular must contend with an increasingly assertive user population and a more competitive service market.

2. MANUFACTURERS BEGIN TO TAKE CONTROL

- As the installed base grows, as user demands for improved service increase, and as equipment sales moderate, manufacturers turn more attention to service. Increased dependence on service revenues is a two-edged sword, however. On the one hand, vendors are somewhat less vulnerable to the market changes in equipment sales in that service seems to be relatively "recession proof." On the other hand, service is a very labor-intensive function and is not as responsive to cost-cutting techniques as other areas such as manufacturing.
- To keep the established sales channels in place while improving the level of support, vendors must work with, and compliment, distributors. However, since vendors are more inclined to deal directly with users to identify problems and develop solutions, manufacturer/distributor relationships often become strained. Several strategies have emerged to attack this problem.
 - Some vendors will phase out distributors by establishing direct sales and service groups as territories become available.
 - Other vendors are attempting to impact the quality of service offered by distributors by placing additional demands on those distributors in such areas as parts inventory and additional training on the manufacturer's product line.
 - Vendors are providing improved remote diagnostics and utilizing modular systems as two additional aids for distributors to use to improve response and repair time.

3. PRICE BECOMES A COMPETITIVE WEAPON

- While service price is not as important to users as reliability and response/repair times, users nevertheless begin to view service more as a generalized commodity than as a specialized maintenance activity.

- As hardware becomes more reliable, users think of maintenance as a declining need and are reluctant to spend more dollars for fewer required services.
- When hardware does not need to be repaired, users see fewer on-site repairs and more component "swaps." And, as the required skill level of the FE decreases, users typically see a reduced need to commit themselves to one particular vendor.
- Users also become concerned that service prices are increasing without a corresponding increase in quantity and quality of services.
- Users expect, but do not receive, discounts for self-maintenance.
- Some vendors, particularly TPM vendors, fuel this new view of price as they aggressively promote comparisons based on cost-effective services rather than the "brand new" reputation of the service vendor.
- These falling prices generally are not temporary, forcing vendors to explore other service strategies in search of profits.
- The sophistication of telecommunications configurations and the inconvenience (or impossibility) of depot-like service forces users to require on-site services at a time when vendors are trying to hold the line on prices.

4. NEW TECHNOLOGY USED TO CUT COSTS

- The need to hold down service costs and maintain high levels of service profitability along with the continuing need to improve system reliability become the prime motivations behind the development of improved service technology.

- As systems become more reliable, there is increased pressure both from users and competitive vendors to keep maintenance prices down. Successful service vendors are forced to use new technology in order to keep costs down and remain competitive.
- These technical changes are designed to improve uptime and service-ability of equipment while reducing the cost of providing service.
- Changes that rely on technology to improve service include:
 - Redundant and fault-tolerant systems that include resident self-diagnostics and that require less FE skill and more modular component exchange repair, reducing the number of on-site calls and permitting the scheduling of service and the allocation of resources.
 - Remote support (both vendor-proprietary and multivendor) that facilitates remote diagnostics, reduces callbacks, and allows better management of parts inventory.

5. VENDORS OFFER FULL SERVICE

- In order to withstand the pressures to lower service pricing (resulting from maintenance becoming a commodity), vendors move to distance themselves from a "maintenance only" image. Service vendors begin to integrate all post-sale services into one department (preferably the customer services department) in order to develop an image of a total service company.
 - The primary advantage of offering a total package is that it allows the vendor to understand the user's needs and "control" the user's sites. However, it is also important to note that the total service vendor will retain name and service product loyalty among users, while strictly hardware maintenance vendors will be forced to do business in an increasingly price-competitive market.

- In addition to site control, a total-support package can contribute to overall service profitability. Even though users are becoming more resistant to hardware service price increases, there is little evidence that this trend is being carried over to other post-sale support areas. In fact, users may be willing to pay premiums for improved post-sale support services such as software support.

- A critical issue of full service is the vendor's policy with respect to servicing "foreign" equipment that exists in multivendor sites. Vendors must decide if they will:
 - Ignore foreign equipment.
 - Diagnose, but not repair, this equipment.
 - Repair or have repaired defective foreign equipment.

- Perhaps the best indication of likely vendor policy in this regard is Integrated Service Management (ISM), a new AT&T service which will include selected TPM services. As described by the company, ISM will offer customers a single point of contact for merging disparate technology, accommodating multiple vendor systems, designing customer networks, and administering and managing total service support operations.

- The company has not publicly identified third-party products which will be serviced under ISM. It seems likely that AT&T will select products that result in increased account control rather than simply increased service revenue, thus leading to single service control of the user's service contracts.

B. SERVICE COST CONTROL

- Although the costs of delivering service are increasing, vendors are faced with some price resistance from already dissatisfied users and a body of competitors working to turn lower prices to their advantage. As one strategy to achieve profitability, vendors must turn to service cost control.
- One key to improved service, particularly in the areas of parts supply and logistics and post-sale support (parts and supplies sales, consulting, training, etc.) is centralization.
 - It affords the much more efficient "just in time" inventory procedure.
 - It facilitates a more coordinated and faster dispatching effort.
- One of the most successful applications of centralized support technology is remote support services. Its advantages include:
 - Enhanced ability to improve response time by initiating diagnostics at the time of the initial problem call.
 - Improved repair time, especially when "fixes" are made from remote locations without involving an on-site FE.
 - Reduced no-fault calls, callbacks, and on-site calls in general, resulting in a more efficient application of the FE's time.
 - Reduced level of skill required of the FE since the FE is more easily supported by experts at remote support centers.
- The disadvantages of remote support, while they do not offset the economic and performance advantages, must also be noted.

- Since an on-site FE is sometimes regarded as a measure of prestige or a "natural" part of service, some clients resist the reduction of customer contact and "hand-holding."
 - Users are concerned that the security of their system could be violated by unauthorized remote access.
 - Users want to understand at least the problem determination process and feel excluded from the interaction diagnostics between the expert and the system.
 - Users may not understand the diagnostics process and attempt to conceal their ignorance by not supporting remote support.
- A second area affected by service technology is dispatching. While many vendors seem to show initial dissatisfaction with a "hotline" and central or regional dispatch centers, they begin to appreciate the efficiencies after a short time. Vendors should take a more active role in demonstrating the advantages of centralized dispatching for, in the long run, it will be a necessary part of an efficient operation.
 - The final factor increasing vendor dependence on service technology will be user requirements for flexibility. There is a growing indication that at the low end of the market users want to be more involved in alternative forms of maintenance. This would include depot maintenance, some user-initiated repairs, and some user-initiated diagnostics.
 - As a consequence of this user pressure, vendors are significantly changing the design of the equipment. More and more, vendors are taking service into consideration at the equipment design stage so that parts are modular and easily diagnosed and replaced. This conforms to user requirements for service flexibility (i.e., the user can perform some maintenance), and it also reduces the vendor's labor costs (FEs spend less time on site because they can now replace rather than repair individual modules).

VI CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

VI CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

A. STRUCTURE OF THE CHANGING MARKET

- The telecommunications service market is changing rapidly as a result of user pressures and increased vendor competition. Telecommunications service vendors will need to address these changes to remain profitable.
- Exhibit VI-1 lists several of the factors affecting the structure of telecommunications service.
 - The growth of end users and the requirement for near-100% availability of telecommunications capability has created a rapidly expanding service market. But much of the service being provided is less than what users require, creating a level of dissatisfaction with current service vendors.
 - In response to this dissatisfaction and as a means of bolstering corporate revenue that will result as user demand for hardware moderates, manufacturers are seeking control of the telecommunications service market.
 - While there will continue to be opportunities for dealers/distributors as "convenience" vendors and TPM vendors as "budget" vendors, manufacturers should realize the larger opportunities by offering "single-source

EXHIBIT VI-1

SERVICE STRUCTURE CHANGING

- Users Increasingly Dependent on Availability
- Manufacturers Aggressively Pursuing Service Revenue
- Non-Hardware Services Will Differentiate Vendors
 - Software Support
 - Professional Services
 - Education and Training

full service." By differentiating themselves from "hardware-only" vendors and by unbundling services so that users have a menu of service options, manufacturers will establish control over the user site and gain a greater understanding of user needs.

- The market share controlled by non-manufacturing vendors will depend on their ability to identify and enter market niches while responding to increased competitiveness from overall leaders and market niche leaders (see Exhibit VI-2).
 - Market niches should be available to vendors who are able to offer services to users in remote geographic locations, users who are price sensitive and require hardware-only services, or users who have telecommunications integration requirements that involve multivendor environments (since manufacturing vendors are reluctant to provide any service beyond diagnostics, if that, in multivendor sites).
 - These vendors should watch for and be prepared to respond to price reductions by major vendors attempting to hold customers and make it difficult for resellers and TPM vendors to compete. In these instances, to be competitive vendors must initiate service cost reductions, primarily by reducing labor-intensive, on-site expenses, but also by unbundling services so that users are able to choose from a menu of services that are priced to be competitive for typical services and command a premium for extraordinary services.

B. DEALING WITH HIGH USER EXPECTATIONS

- The escalating importance of telecommunications availability and the resulting short-fall of vendor performance compared to user requirements is unlikely to change through the end of the decade.

EXHIBIT VI-2

PROACTIVE MARKETING OF SERVICE

- Knowledge of User Needs Should Drive Service
 - Identify and Enter Niches
 - Package/Price Services Carefully
- Respond to Competitive Pricing
 - Market Vendor's Own Service Quality, Options, and Advantages
 - Reduce Service Costs
 - Unbundle and Reprice Services

- It is unreasonable to think that vendors can address user satisfaction directly, for to do so would increase the cost of services beyond the users' threshold of sensitivity. Rather than trying to keep up with these ever-increasing user expectations, vendors should target the users' "perceptions" of service.
- While it is difficult to categorize users, some services are much more influential on satisfaction levels than others. These influential services include response/repair time, hardware/software maintenance, FE skill level, and parts availability.
- Improvements in these services result in an improved level of user satisfaction. Improvements in other, less important services will have less of an impact. That is, as the service vendor improves a service, that service becomes more important to the user and, therefore, exerts a greater influence on the user's overall level of satisfaction. This action/reaction is as true for low cost, low priority service areas as it is for high priority services such as response/repair time. INPUT believes that by emphasizing improvements in low priority areas, vendors will experience an even greater improvement in user satisfaction than if a similar amount of capital is invested in a high priority service. Some low priority areas to target include consulting, documentation, training, network planning, and the escalation procedure. Vendors must be careful, however, to avoid the creation of additional user dissatisfaction caused by the prioritization of service resources.
- Concurrent with this, vendors should show flexibility in the number and type of services offered. These additional services should be designed to meet user needs rather than the service organization's capabilities.
 - One such strategy is to accommodate user requirements for a single access point for all post sales support services. This type of support organization will not only improve user satisfaction, but will also increase service revenues and profitability. In addition, by developing

an image as a total support vendor, manufacturers will be able to distinguish themselves from the highly competitive, hardware-only service vendors.

C. SERVICE MODE OPPORTUNITIES

- Throughout the forecast period, telecommunications service will be hardware oriented. Not only is this the most visible area of service, it is also the most price sensitive. As applications of telecommunications increase, users are less price sensitive, opting for the quality of service generally available from manufacturers. As service competition grows, however, a commodity notion of service will prevail, providing opportunities for competitive pricing by TPM vendors and full service strategies by manufacturers.
- Hardware maintenance is an area in which users expect substantial improvements in the future. Exhibit VI-3 lists what INPUT believes are the most important components of a successful adjustment in hardware maintenance. Essentially, the exhibit emphasizes that vendors must become more efficient in delivering hardware maintenance (i.e., cut down on on-site repairs, increase inventory turnover, etc.) while at the same time become more flexible in meeting user needs. Low-demand services (e.g., annual site audits) should be unbundled from the basic service contract so that only those users who require the service will pay for it.
- Currently, a pressing user demand for service improvements is in the area of software support. INPUT recommends that vendors take an aggressive stance on supporting software. As shown in Exhibit VI-4, one of the first steps in improving software support is to integrate software maintenance into the Customer Support Program. INPUT is not suggesting that vendors cross train hardware and software engineers--quite the contrary. INPUT believes that specialization is the key to profitable service. However, it is important that users perceive that they have a single source of support.

EXHIBIT VI-3

HARDWARE MAINTENANCE INCREASE EFFICIENCY AND MAINTAIN FLEXIBILITY

- Centralize Dispatching, Logistics Operations, and Remote Support
- Decrease Spare Parts Distribution Centers
- Increase Remote Support
- Expand Menu of Service Products
- Enhance Contract Flexibility
- Unbundle Low-Demand Services

EXHIBIT VI-4

SOFTWARE SUPPORT VENDORS MUST IMPROVE SERVICE

- Integration of Software Maintenance into Customer Support Program
- Increase Remote Support
- Greater User Involvement in Software Maintenance
- Development of Software Data Bases for Access by Users
- Combine Systems and Applications Software Support into One Department; Increase Support for Applications Software
- Consolidate Software Support into National Service Centers

- Although cross-training is not necessary, hardware and software engineers must work together effectively so that users feel that they have one central support group solving problems. Users that suffer from finger-pointing between hardware and software support departments have, on average, the lowest satisfaction rate of all customers interviewed. Conversely, vendors who have successfully integrated hardware and software support have the highest user ratings in the industry.
- A consolidated software support center--as opposed to regional centers--is recommended because of the efficiencies inherent in one central location. Vendors can provide a variety of different services economically from one location that they may not be able to offer if regional centers were used. For example, one small system vendor maintains a central support center in the same building with the company's software R&D staff; even the most minor software support problems can have a rapid turnaround time when the original programmer is available.
- Vendors have often neglected another important software support resource--the end user. INPUT has found that many users will not object to becoming involved in their own software support if they are given the proper support. User-accessible tools such as data bases of software fixes or vendor sponsorship of user group meetings can be very effective in both reducing software support calls and improving user satisfaction with service. Not all users will be interested in this option, but if the vendor segments the user base properly, substantial opportunities will come from encouraging some self-maintenance of systems software.
- Although vendors are making substantial improvements in software support, user requirements are growing at an even more rapid rate and are expected to increase steadily throughout the forecast period. As a result of the continuing demand for software services and support, INPUT anticipates steadily

increasing prices without user resistance. In fact, users will most likely be willing to pay higher support fees for improved service in such areas as documentation, improved communications, increased diagnostics, etc.

- Unbundling professional services such as planning and consulting has benefited those vendors who have done so. With the increase in voice/data integration, user demand for planning and implementation support has been particularly strong. While in many cases vendors need to offer either hardware products or professional services, vendors should position themselves to sell. By providing independent consultation, vendors can influence customers' purchasing decisions. Care must be taken, however, to ensure the customer feels that the vendor is offering the best advice free of "hidden agendas" and strings back to the vendor's products.
- Education and training is one of the fastest growing service segments in the industry. INPUT believes that this growth will continue through the remainder of the decade and that it represents a substantial opportunity for vendors.
 - The increasing user demand for service is also based on the growing penetration of computerization in most industries. As more and more companies provide telecommunications functions, they are looking to the vendor to train their employees in the effective use of this capability.
 - An additional advantage to the growing user demand for education and training is the effect these services have on user satisfaction rates. Vendors who have initiated training programs have improved user satisfaction with service considerably. This, in turn, promotes an even greater demand for training.
- The increasing margin derived from education and training will result primarily from more efficient techniques and delivery modes.

- Live instruction, currently the most common training method, is limited in profit potential due to the inherent costs of on-site instruction. Further, users are objecting to the travel costs and work time lost through training at remote sites.
- Video-based instruction is growing, but will represent only a small portion of the market by 1990.
 - . Video-based instruction can be an excellent method of providing a quick overview of a subject; however, detailed instruction is frequently unsuccessful because of the lack of interactive testing capabilities. In addition, the high cost of revising video production makes it difficult to adapt a video training program on one subject to any other subject area.
- Computer-aided instruction/computer-based training (CAI/CBT) is growing and represents the major opportunity in this market. CAI/CBT, while costly to develop initially, is relatively inexpensive to upgrade.
- While hardware servicing will continue to dominate as a revenue source, other services are coming into their own and offer not only faster growth prospects, but also higher levels of user satisfaction.

APPENDIX A: VENDOR QUESTIONNAIRE

APPENDIX A

VENDOR QUESTIONNAIRE

TELECOMMUNICATIONS VENDOR PROFILE

Company Name _____ President _____

Address _____ 1984 Revenues _____

Respondent Name _____

Title _____

Telephone Number _____

COMPANY PRODUCTS

- PBX
- Carrier
- Communication Processor
- LAN
- Modem
- Multiplexer
- Converter

SERVICE AND SUPPORT - HARDWARE

1. Hardware service delivery mode
 - A. Remote
 1. Hotline (toll-free)
 2. Diagnostics
 - B. On-site
 - C. Mail (documentation, parts, etc.)
 - D. User self-support
 1. Diagnostics
 2. Module swapping
 3. Depot delivery
 4. Other
 - E. Factory mail-in, repair/return
2. Parts availability, at user's site or at depots
3. Pricing
 - A. How established
 1. Competition
 2. Set by port
 3. Individual components priced separately
4. Unbundling of hardware services
 - A. Installation
 - B. Planning
 - C. Consulting
 - D. System implementation
 - E. Other

SERVICE AND SUPPORT - SOFTWARE

5. Software support delivery mode

A. Remote

1. Hotline (toll-free)
2. Diagnostics
3. Remote fix
4. Problems data base

B. On-Site

C. Mail (documentation, magnetic media, etc.)

D. User self-support

6. Description of software service products

A. Extended coverage

B. Unbundling (planning/consulting)

C. Pricing

D. Names of different programs

THIRD-PARTY MAINTENANCE

7. Products serviced but not manufactured

- | | |
|--|---|
| <input type="checkbox"/> Mainframe | <input type="checkbox"/> Local networks |
| <input type="checkbox"/> Minicomputer | <input type="checkbox"/> Branch exchange |
| <input type="checkbox"/> Personal computer | <input type="checkbox"/> Modem |
| <input type="checkbox"/> Disk drive | <input type="checkbox"/> Multiplexer |
| <input type="checkbox"/> Tape drive | <input type="checkbox"/> Communications processor |
| <input type="checkbox"/> Word processor | <input type="checkbox"/> Terminal/workstation |

8. TPM services provided

- | | |
|---|--|
| <input type="checkbox"/> Preventive maintenance | <input type="checkbox"/> Engineering changes |
| <input type="checkbox"/> Software support | <input type="checkbox"/> Software installation |
| <input type="checkbox"/> Hardware installation | <input type="checkbox"/> Remedial mainatenance |
| <input type="checkbox"/> Conversion/upgrades | <input type="checkbox"/> Consulting |
| <input type="checkbox"/> Relocation | <input type="checkbox"/> Refurbishment |
| <input type="checkbox"/> Training | |

PRICING

9. Prime hours time and material pricing

10. Non-prime T & M pricing

FUTURE TRENDS IN SERVICE

11. Trends

- A. Remote support
- B. Redundant systems/modules
- C. Telecommunications/DP interaction
- D. Third-party maintenance
- E. Pricing

12. Other trends in telecommunications service

- F.
- G.
- H.
- I.

THE COMPANY

13. Number of service locations

14. Number and location of repair depots

15. Number and location of parts depots

16. Total number of service employees

17. Number of engineers

- A. In field
- B. At depot/headquarters

18. Services provided by the distribution network

APPENDIX B: USER QUESTIONNAIRE

APPENDIX B
USER QUESTIONNAIRE
PBX

1. How many PBXs do you have and how long have they been installed?

<u>Number of PBXs</u>	<u>Vendor</u>	<u>Number Devices/PBX</u>	<u>Install. Date</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. Who performs the following services on your PBXs?

	<u>In-House</u>	<u>Manufacturer</u>	<u>TPM</u>
Hardware Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software Support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network Planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3a. What response time (in hours) do you expect from vendors on serious problems?
_____ hours.

b. On the average, how many hours does it take your vendor to respond to these problems? _____ hours.

4a. What repair time (in hours) do you expect from vendors on serious problems?
_____ hours.

b. On average, how many hours does it take your vendor to repair serious problems? _____ hours.

5a. What percent uptime have you experienced for your PBX over the last six months? _____%

b. What level of uptime is expected? _____%

6a. During the last six months, what percent uptime was experienced during normal business hours (e.g., from 8am to 5pm)? _____%

b. What percent uptime is expected during this period? _____%

7a. Over the last six months, what has been the average number of system interruptions experienced per month? _____

b. What percent were hardware related? _____%

c. What percent were software related? _____%

8. Please rate on a scale of 1 - 10 (1 = Low, 10 = High), a, the importance of the following services.

b, your satisfaction with the vendor support of these services.

	a. <u>Importance</u>	b. <u>Satisfaction</u>
Overall Support	_____	_____
Hardware Maintenance	_____	_____
Software Support	_____	_____
Vendor Response Time	_____	_____
Vendor Repair Time	_____	_____
Parts Availability	_____	_____
Problem Escalation	_____	_____
Field Engineering Skill	_____	_____

9. What percent of your company's PBX maintenance budget is allocated to:

a. Internal Resources _____%

b. External Resources _____%

10. In your organization, which technological trends are having the greatest impact on PBX support and why?

_____	(trend)	_____	(why)
_____	(trend)	_____	(why)
_____	(trend)	_____	(why)

11a. If voice and data communications report to the same function, which organization do they report?

☐ IS

☐ Communications

☐ Administration

☐ Controller

☐ Other _____

b. When was voice and data communications support merged? _____

12. What change would you like to see in the way PBXs are currently serviced?

a. Internally _____

b. By Vendors _____

APPENDIX C: DEFINITIONS

APPENDIX C: DEFINITIONS

- APPLICATIONS SOFTWARE - Software that performs processing to service user functions.
- CONSULTING - Includes analysis of user requirements and the development of a specific action plan to meet user service and support needs.
- DISPATCHING - The process of allocating service resources to solve a support-related problem.
- DOCUMENTATION - All manuals, newsletters, and text designed to serve as reference material for the ongoing operation or repair of hardware or software.
- END USER - May buy a system from the hardware supplier(s) and do own programming, interfacing, and installation. Alternatively, may buy a turnkey system from a systems house or hardware integrator.
- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.
- ENGINEERING CHANGE ORDER (ECO) - The follow-up to ECNs which include parts and a bill of material to effect the change in hardware.

- ESCALATION - The process of increasing the level of support when and if the field engineer cannot correct a hardware or software problem within a prescribed amount of time, usually two to four hours for hardware.
- FIELD ENGINEER (FE) - For the purpose of this study, field engineer, customer engineer, serviceperson, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.
- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. May also develop control system software in addition to installing the entire system at the end-user site.
- LARGE SYSTEM - Refers to traditional mainframes including at the low end IBM 4300-like machines and at the high end IBM 308X-like machines. Large systems have a maximum word length of 32 bits and a standard configuration price of \$350,000 and higher.
- MEAN TIME BETWEEN FAILURES (MTBF) - The elapsed time between hardware failures on a device or a system.
- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.
- MEAN TIME TO RESPOND - The elapsed time between the user placement of a service call and the arrival of a field engineer at the user's location.
- MINICOMPUTER - See Small Systems.
- OPERATING SYSTEM SOFTWARE (SYSTEMS SOFTWARE) - Software that enables the computer system to perform basic functions. Systems software,

for the purposes of this report, does not include utilities or program development tools.

- PERIPHERALS - Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.
- PLANNING - Includes the development of procedures, distribution, organization, and configuration of support services. For example, capacity planning, "installation" planning.
- PLUG-COMPATIBLE MAINFRAME (PCM) - Mainframe computers that are compatible with and can execute programs on an equivalent IBM mainframe. The two major PCM vendors at this time are Amdahl and National Advanced Systems.
- SMALL BUSINESS COMPUTER - For the purpose of this study, a system which is built around a Central Processing Unit (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented systems software support.
- SMALL SYSTEM - Refers to traditional minicomputer and superminicomputer systems ranging from a small multi-user, 16-bit system at the low end to sophisticated 32-bit machine at the high end.
- SOFTWARE ENGINEER (SE) - The individual that responds (either on-site or via remote support) to a user's service call to repair or patch operating systems and/or applications software.
- SOFTWARE PRODUCTS - Systems and applications packages which are sold to computer users by equipment manufacturers, independent vendors, and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

- SUPERMINICOMPUTER - See Small System.
- SYSTEM INTERRUPTION - Any system downtime requiring an Initial Program Load (IPL).
- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. May also develop systems software products for license to end users.
- TRAINING - All audio, visual, and computer-based documentation, materials, and live instruction designed to educate users and support personnel in the ongoing operation or repair of hardware and software.
- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to fulfill the processing requirements of a single application completely.

